

Letter for Electronic Distribution

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Bureau of Federal Facilities
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August 1, 2000

Ms. Runore C. Wycoff, Director
Environmental Restoration Division
U.S. Department of Energy
Nevada Operations Office
P.O. Box 98518
Las Vegas, Nevada 89193-8518

RE: Nevada Division of Environmental Protection's Evaluation of Additional Data
Requirements and Preferred Investigation Strategy for Central and Western Pahute
Mesa (Corrective Action Units: 101 and 102)

Dear Ms. Wycoff:

The UGTA Technical Strategy Flow Chart in Appendix VI of the Federal Facilities Agreement and Consent Order (FFACO) is currently being revised. This revision identifies the need for the Nevada Division of Environmental Protection (NDEP) to provide DOE with an evaluation of the data requirements for each Corrective Action Unit and the rationale behind these requirements. U.S. Department of Energy (DOE) has requested this guidance for the Underground Test Area Project (UGTA) Corrective Action Units (CAU) including the Central and Western Pahute Mesa CAUs (CAUs 101 and 102).

NDEP approved, with comments, the *Corrective Action Investigation Plan, Revision 1, Corrective Action Units 101 and 102: Western and Central Pahute Mesa, Nevada Test Site, Nevada* (PM-CAIPR1) in a letter dated Dec. 20, 1999 (Liebendorfer to Wycoff). The comments submitted on this document identified significant informational and data deficiencies which need to be resolved before a corrective action decision can be rendered.

NDEP points out that the overall rationale for the collection and analysis of additional data can be found in Subparts II.1.b.ii, II.1.c, IV.14, and IV.15 of the FFACO. Review of these Subparts will reveal that sufficient data collection is required in order to thoroughly evaluate

and predict the movement of contaminants in the subsurface. Specific data requirements and subject areas needing further technical analysis are presented below.

Additional Data Requirements and Supporting Rationale

1) Conceptual Model Revision Needed

NDEP's primary reason for establishing data requirements for Central and Western Pahute Mesa concerns the Conceptual Model (CMO). It is NDEP's understanding that DOE's current CMO for Central and Western Pahute Mesa remains the same as the CMO that was presented in the PM-CAIPR1. This CMO is based on a broad, regional understanding of groundwater flow. The CMO relies heavily on the Nevada Test Site Regional Model and other regional data, and not on CAU-specific studies and data.

NDEP cannot determine from the CMO the size and nature of the current state of groundwater contamination resulting from weapons testing. The CMO lacks clarity as to what specific data are available and were utilized in the development of the CMO. This lack of specific detail defining the extent to which the CMO is based on CU-specific data, limits NDEP's ability to identify specific elements of the CMO needing improvement.

The CMO must be revised and updated. The CMO must present a thorough picture of the hydrogeology, flow conditions, nature and extent of contamination, and current understanding of expected future contaminant fate and transport for the Central and Western Pahute Mesa Corrective Action Units. An initial step for revising the CMO would be to incorporate recent data and analysis from the Pahute Mesa/Oasis Valley drilling program.

2) Regional Controls on Groundwater Flow and Water Budget

NDEP perceives that the major geologic structural controls which influence groundwater movement into, under, through, and out of the Pahute Mesa area are still not adequately understood. This is particularly important for this CAU because of the size of Pahute Mesa and the complex array of hydrogeologic features found there. Controls would include features such as faults, shear zones, and fracture zones. Abrupt changes in lithology around and across the caldera complexes that comprise a significant portion of this area, such as intrusives and vitrophyres, may be significant barriers to flow. Conversely, the presence of highly-transmissive fractured aquifers in lithologies where this is unexpected (such as the volcanic unit in Frenchman Flat) should also be investigated. NDEP maintains that a firm regional understanding of hydrogeology is necessary to allow the significance of detailed, site-specific studies to be fully comprehended within a regional framework.

Another aspect of the hydrogeology needing further investigation involves the water budget for the CAU-model area. Studies which attempt to estimate the water entering and leaving the Pahute Mesa system through recharge, baseflow, and evapotranspiration are needed. A water budget is a useful tool for evaluating how well you understand your system and could be applied to the Pahute Mesa modeled area. It can provide a measure of confidence that model boundary conditions were correctly chosen and that those parameters distributed across wide areas (principally fluxes and recharge) fall within reasonable ranges.

A water balance could be developed for sub areas in the CAU. These subareas could be used to tie together hydrologically diverse portions of the CAU into a more acceptable, wider-area model (additional comments on a sub-area approach to the investigation are found in the **Preferred Investigation Strategy** section below). The point is that some approximation of the water balance for the areas of investigation must be calculated prior to attempting detailed numerical modeling. NDEP views an understanding of regional controls and water balance as fundamental elements of the investigation, and encourages DOE to seek the council of the Technical Working Group (TWG) in formulating these studies.

3) Hydrologic Parameters

The flow model being developed for Pahute Mesa must rely on a complete and reliable set of hydrologic parameter data. It is NDEP's position that existing data are too sparse. The ranges of parameter values in the existing data may not be representative and may not express the true variability found across the area of investigation. Additional data points for the hydraulic parameters used in the model, or those which simply provide a basis of understanding of the flow system, need to be measured or derived for the principal aquifers. These include water level, gradient (vertical and horizontal), hydraulic conductivity, aquifer thickness, and storage coefficient.

4) Contaminant Transport Parameters

Parameters effecting contaminant transport, such as dispersivity, diffusivity, and porosity require further investigation. There is a concern that DOE's modeling efforts may rely too heavily on previously-published values for similar aquifer types and not on CAU-specific data. Though literature values for these parameters, and numbers derived from laboratory batch experiments, may produce acceptable results, there is no substitute for in-situ measurements. Additional work in this area might compliment existing studies performed for the Yucca Mountain project.

5) Hydrogeochemical Data

Studies of the aqueous geochemistry, which are used to interpret the hydrogeology of the large and complex Pahute Mesa area, are poorly discussed and represented. Additional knowledge

is needed in terms of the major ion chemistry, trace elements, and isotopic ratios in the groundwater flow system. Collection and analysis of additional field data of this nature must be done to further characterize the hydrologic system.

6) Regional Heat Flow

Temperature data from the Pahute Mesa/Oasis Valley drilling program has indicated that there is geothermal heat flow in the Pahute Mesa Area. Further analysis needs to be made of these and any other available data in order to determine if this heat flow has any impact on the groundwater flow and contaminant transport in the Pahute Mesa area. If it is shown that there is a geothermal component to groundwater flow, DOE should consider using a computer modeling code which allows for heat-driven flow.

7) Important Event Characteristics

As investigations of the CAUs have progressed, it has become apparent that what might be termed “important event characteristics” can have a significant effect on radionuclide availability and transport. The CAI must not overlook the potential impact these aspects of weapons testing may have. A discussion is required regarding data available regarding the following:

- a) shafts, tunnels, and various conduits which may enhance near-field radionuclide movement,
- b) special or unusual radionuclides or other materials introduced into the near-field environment,
- c) unusual features of the weapon design or test circumstances that could effect contaminant availability and transport.

The laboratory studies being conducted by Lawrence Livermore National Laboratory and others, involving the availability and solubility of radioactive species in groundwater, are considered an important component of the overall investigation. NDEP believes the inclusion of CAU-specific data in these studies should be considered where possible. We would encourage that the TWG make recommendations on this point in terms of incorporating applicable field sample data in these studies. NDEP considers the radionuclide fate and transport work being undertaken as part of UGTA to be unique, with respect to similar studies being conducted at other facilities in the DOE complex. That is, these studies should be sensitive to the fact that the suite of radionuclides produced in nuclear detonations is different than those found at sites where special nuclear materials were merely produced and processed. Additionally, the specific geologic materials that the source term interacts with in the UGTA CAUs should be considered in this work.

Preferred Investigation Strategy

Detonations at Pahute Mesa occurred over a wide area and in a complex hydrogeologic setting. There is concern on NDEP's part that hydrogeologic parameters may be significantly different across the many faults and among the various hydrostratigraphic zones present at Pahute Mesa. In an effort to divide the area of investigation into manageable portions and to reduce the overall complexity of the investigative task, NDEP suggests that segmenting Pahute Mesa into several sub-areas may be an effective strategy. Breaking the CAUs into sub-areas based on hydrogeologic criteria would allow a more focused examination of near-field parameters affecting flow and transport.

For example, two sub-areas of interest that could be investigated within Western Pahute Mesa (CAU 102) are the following. The first includes the area west of the West Boxcar Fault within the Paintbrush Group of geologic units. The second would be comprised of the extreme northwest corner of the NTS, outside of the Grouse Canyon and Area 20 Calderas, within the Timber Mountain Group. The rationale for this partition is water level and other data suggesting a hydrogeologic discontinuity between the two areas.

A smaller-scale sub-area approach taken initially, might be followed by a larger-scale approach should similarities in parameters be found in certain areas. This approach might identify those areas requiring more intensive investigation while allowing other, broader regions to be lumped together and treated similarly.

In order to collect the needed samples and make measurements at depth, it is anticipated that a number of new wells will be required within each sub-area. NDEP expects DOE and the technical work group to devise the purpose, location, samples to be collected, and measurements to be made for each boring. Any drilling proposal submitted should contain at a minimum:

- a) the location of each proposed well,
- b) the anticipated diameter and target depth of each proposed well,
- c) the geologic units that will likely be encountered at each proposed well location,
- d) the anticipated depth to water at each proposed well location,
- e) the purpose of the well and tests to be run, a detailed discussion of each log to be run, the sample collection methodology for each type of sample to be

collected, and the method of analysis of each type of sample collected at each proposed well location.

Future Work Scope and Budget Proposals

NDEP expects DOE/NV to begin development of an addendum which will refine the existing conceptual model and propose additional field investigations. Furthermore, DOE will, within one month of the date of this letter, propose a Milestone Date for the receipt by NDEP of an addendum and include in that letter the proposed contents of the addendum. NDEP acknowledges your letter of July 6, 2000 in which DOE agrees to propose work scope to address NDEP comments.

DOE/NV needs to begin to develop the work plans, Task Agreement Plans, and budgets to accomplish all of the above and to consult with NDEP in a timely manner regarding their respective development. NDEP understands that work scope must be defined by September 30, 2000 in order for inclusion in the next UGTA baseline. We trust that the above requirements, comments, and suggestions will assist you in preparing work scope and budgets that are agreeable to all parties.

Questions regarding this matter may be addressed to S. Jaunaraajs at (775) 687-4670 Ex. 3030, C. Goewert at (702) 486-2865, C. Case at (775) 687-4670 Ex. 3029, or me at (775) 687-4670 Ex. 3039.

Sincerely,

Paul J. Liebendorfer, P.E.
Chief
Bureau of Federal Facilities

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cc list on page 7

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